

Report for 2001MS2601B: Spatial Pattern in Land Use: Its Role in Determining Surface Water Quality

There are no reported publications resulting from this project.

Report Follows:

PROBLEMS AND RESEARCH OBJECTIVES:

Mississippi streams flood often and destructively. Our goal is to understand factors controlling this phenomenon at the landscape scale. In the hydrological cycle, water runs through the entire landscape, so it is reasonable to expect land alterations anywhere in the landscape to influence the amount and character of surface water runoff. It is unclear, however, to what extent streams actually integrate land use alterations over the whole watershed. There is abundant evidence that stream condition reflects the character of adjacent stream banks. Whole-watershed effects are less-commonly described, but the few empirical studies available suggest collective impacts at the scale of watersheds. We seek to compare local and landscape effects in a variety of stream parameters, both physical and biotic.

The issue is of practical concern because land use may radically alter the rate, volume, and chemical composition of runoff. Paralleling the suburbanization of south-Mississippi communities is an increase in the rate of catastrophic floods in suburban streams and a degradation of biological communities, implying causation by human manipulation of the landscape. We hope to clarify the linkage between specific land use events in a watershed and impacts in the stream that drains the area. Our results will be presented as a model allowing the impacts of a particular land use alteration to be predicted before development. Ultimately, such insight may be used to control flooding and protect aquatic diversity.

METHODOLOGY:

Models will be constructed by regression of physical and biotic parameters on geomorphological and land use parameters weighted in various ways reflecting competing models of watershed function. Land use is determined by supervised classification of aerial images recorded in October 2000, provided to us NASA. Models will be constructed using the buffer function in ARC/INFO and applied to landuse data layers imported from the remote imagery.

Stream parameters will be used as the response variables. These include physical/chemical/hydrological variables such as temperature, dissolved oxygen, conductivity, flood ratio, dissolved nutrients, sediment load, sediment texture, bank erosion, and turbidity, and biotic/habitat variables such as accumulation of woody debris, algal growth, and fish abundance, diversity, and community composition. To lend statistical power to our analysis, we are comparing 26 replicate watersheds in urban/suburban Hattiesburg. Simultaneity of sampling will be accomplished by use of a team of trained field workers.

SIGNIFICANCE:

Because funding began on 1 March, 2001, the project is still in its early stages. However, we have assembled field equipment, established a sampling protocol, and trained a team of field workers. Preliminary data sets show considerable variation among watersheds in several variables, notably temperature range and conductivity. Stream data collection will continue through the summer and fall.